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Abstract

The food of the Capercaillie *(Tetrao urogallus)* in eastern Finnish Lapland (ca. 66°30" – 68°N, 28° – 30°E) and its chemical composition were studied in September–December 1967–1969. A total of 312 crop contents were examined. Leaves of *Vaccinium uliginosum, V. myrtillus* and *Andromeda polifolia,* berries of *V. vitis-idaea, V. uliginosum, V. myrtillus, Empetrum nigrum* and *Rubus chamaemorus* and utricles of *Carex* spp. together comprised 72–80% of the food in September. The Capercaillie was already eating pine needles *(Pinus sylvestris)* in September, when there was still no snow on the ground. The proportion of pine in the diet gradually increased to 81–100% by December, but more rapidly in the adults than in the juveniles, which are still gaining weight from September to November, and thus require as nutritious food as possible. The nutritive value of the food showed a general decrease from September to December. The Capercaillie can survive the severe winter conditions with a diet which contains 7.0 – 7.3% of crude protein.

Introduction

It is well known that the Capercaillie *(Tetrao urogallus)* feeds mainly on the ground during the warmer half of the year and mainly in the trees during the colder half (see reviews by Semenov-Tjan-Sanskij 1959, Seiskari 1962, Kuzmina 1977). During the former period these birds consume a great variety of plant species (more than 160 have been listed) and to a small extent animal matter, while during the latter period they exist for long spells on one or just a few food plants (Zwickel 1966, Kuzmina 1977, Cibisov 1978). The macroscopic composition of the food of this tetraonid is well known in different parts of its range in Eurasia (see literature cited above), whereas its chemical composition is poorly known (see Pulliainen 1970).

Thus it appeared justified to study changes in the macroscopic and chemical composition simultaneously during autumn and early winter, when these birds move from the ground to the trees in a northern taiga area (in Finland) where the winter conditions are known to be severe. The present paper is a record of this study.

Material and methods

A total of 312 Capercaillie with food in their crops were shot in September–December 1967–1969 in eastern Finnish Lapland (ca. 66°30' – 68°N, 28° – 30°E), an area mainly of typical northern taiga with pine *(Pinus sylvestris),* spruce *(Picea excelsa),* birch *(Betula spp.)* and mixed forests and various types of bog and swamp, and also fells in the northern part. The depths of the snow were recorded at the site of shooting in 1968–1969. The birds were sexed and aged (according to Helminen 1963), and the contents removed from the crops and dried in an oven (at +70°C). Leaves, stems, berries and other recognizable plant and animal remains were sorted out from these dried samples.

The crop samples were classified for chemical analysis according to the sex and age of the bird and the month in which it was shot. Within each category all the matter belonging to the same part of the same plant species was pooled and its nitrogen, phosphorus, calcium, potassium and magnesium content (per dry matter) was determined by Viljavuuspalvelu Oy (for methods, see Pulliainen 1973). These results, together with the macroscopic composition recorded, enabled the proportions of these nutrients in the diet to be calculated for each age category in each month. Food items occurring in the crops in very small quantities were not taken into account in these calculations.

Results

Macroscopic composition

Although in September, for example, 52 plant species were identified in the crop samples, four groups appeared to be really important in the diet of all sex and age categories of the Capercaillie, namely leaves of *Vaccinium uliginosum, V. myrtillus* and *Andromeda polifolia,* berries of *V. vitis-idaea, V. uliginosum, V. myrtillus, Empetrum nigrum* and *Rubus chamaemorus,* utricles of *Carex* spp. and needles, shoots, buds and cones of *Pinus sylvestris* (Fig. 1 and 2). In September the two first-mentioned groups accounted for about two-thirds of the food intake of these birds (Fig. 1), and in September and to some extent also October, utricles of *Carex* spp. also constituted important items (Fig. 1), 13 *Carex* species were identified altogether. Pine needles were already being eaten by the Capercaillie in September (Fig. 1), when there was no snow on the ground (Fig. 2) and the birds were seen picking needles from saplings when walking on the ground. Needles, shoots and berries of *Juniperus communis* were important amongst the other plant matter (X 22.0% juv. females, 11.2% juv. males; XI 29.1% juv. males; XII 17.6% adult females). Animal matter did occur in the diet in September–November, but always in small quantities, the greatest proportion recorded being 0.3%.

Both the monthly data (Fig. 1) and the data recorded under different snow conditions (Fig. 2) show that the composition of the diet changes gradually in autumn and early winter, the proportion of *Pinus sylvestris* increasing during this period. This increase was faster in the adult birds than in the birds of under one year of age. Even when there was more than 10 cm of snow the birds still tended to gather food from the ground (Fig. 2).

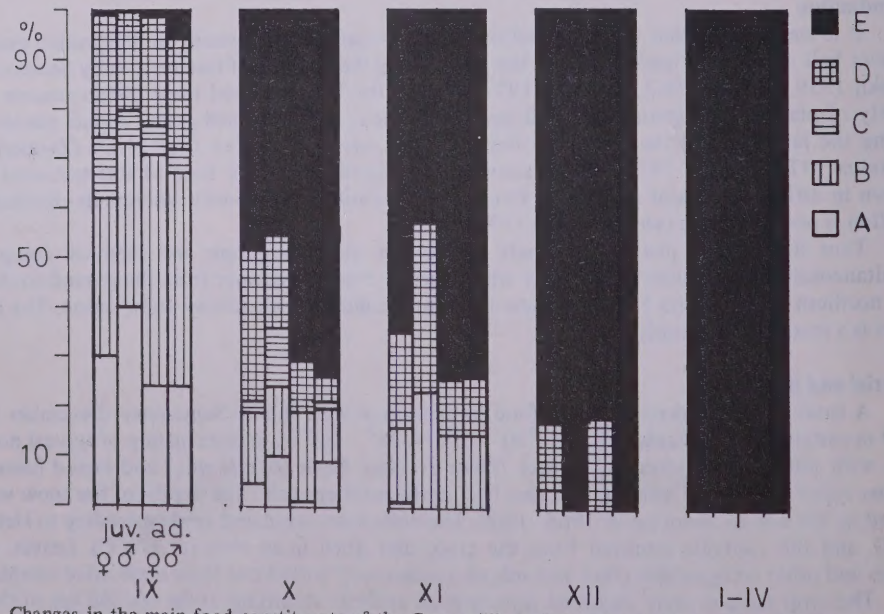

Fig. 1. Changes in the main food constituents of the Capercaillie in September-April in eastern Finnish Lapland. Data for January-April according to Pulliainen (1970). Parts of the columns indicating the food items as follows:-

A = Leaves of *Vaccinium uliginosum, V. myrtillus and Andromeda polifolia.*

B = Berries of *V. vitis-idaea, V. uliginosum, V. myrtillus, Empetrum nigrum* and *Rubus chamaemorus.*

C = Utricles of *Carex* spp.

D = Other plant matter and animal matter.

E = *Pinus sylvestris.*

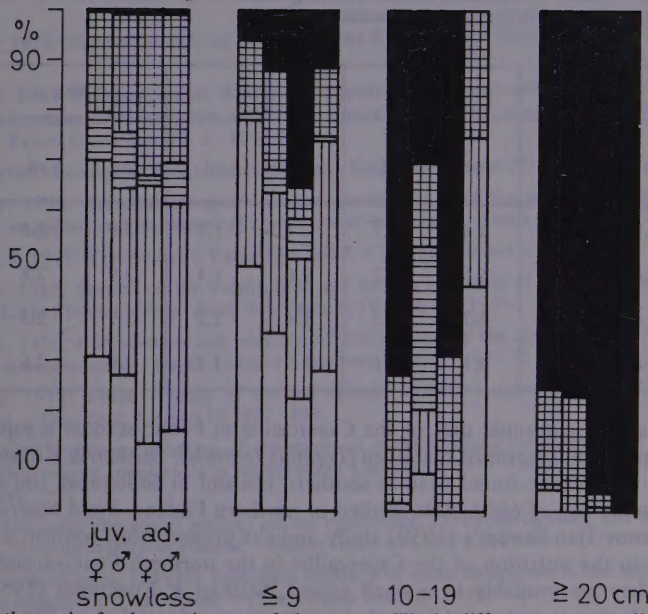

Fig. 2. Changes in the main food constituents of the Capercaillie in different snow conditions in September–December. For explanations see Fig. 1.

Chemical composition

Table 1 shows that the percentages of nitrogen, potassium, phosphorus, calcium and magnesium in the food of the Capercaillie were in every case greater in September than in December, and greater in the food of the juveniles than in that of the adults in September–November, although only the differences in the nitrogen content were statistically significant.

Discussion

In his study on the food of the Capercaillie in the Lapland Game Preserve, Kola Peninsula, which is situated near the present study area, Semenov-Tjan-Sanskij (1959) found that pine needles constitute the main food item from 28 October to 20 May. The birds take them mainly from the crowns of pines, but also from young saplings on the ground. The quantitative data published by Semenov-Tjan-Sanskij (1959) also show that the percentage of *Pinus sylvestris* increases gradually from September to December as follows: IX 0.3%, X 35.2%, XI 69.6% and XII 96.2%. Animal matter was consumed in September and October, but to a minor extent (0.1% and 0.9% respectively). Since the other main constituents of the diet (berries, leaves, etc.) were also the same as those recorded in the present study, it can be concluded that the present findings support his.

Whereas Semenov-Tjan-Sanskij dealt with all the Capercaillie older than three months in one group, the present classification of the birds according to sex and age provides additional information on the nutritional pattern of this species in the northern Fenno-scandian taiga. It was evident that the juveniles tended to take in more nutritious food than the adults in September–November (Fig. 1 and 2, Table 1), the reason for which can be found in the different requirements of these two categories, for as Koskimies (1958) has shown, the juveniles gain weight much faster than the adults from September to November. Body size is naturally of great importance in winter, and by September young male Capercaillie have reached only 69.0% of the maximum adult weight and young females 87.0% (Koskimies 1958). The juveniles require nutritious food, especially proteins (nitrogen), phosphorus and other minerals, in order to build new tissues.

Table 1. Nitrogen, potassium, phosphorus, calcium and magnesium in the crops of juvenile and adult Capercaillie in September–December (1967–1969) in eastern Finnish Lapland.

	N‰		K‰		P‰		Ca‰		Mg‰	
Month	juv.	ad.	juv.	ad.	juv.	ad.	juv.	ad.	juv.	ad.
September	16.7	13.5	8.6	8.2	2.1	1.7	3.9	3.5	1.4	1.2
October	13.2	11.7	6.1	5.2	1.6	1.4	3.9	2.8	1.1	1.0
November	12.6	11.5	5.7	4.3	1.4	1.2	3.7	2.5	1.0	0.9
December	11.6	11.6	4.1	5.1	1.3	1.2	2.9	2.6	0.8	1.0

One detail in the autumnal diet of the Capercaillie in Fenno-scandia is especially interesting, namely the consumption of leaves of the aspen *(Populus tremula).* Seiskari & Koskimies (1955) found that 7 out of 35 Capercaillie found dead in southern Finland in September and October had eaten these leaves, but none out of eight birds studied in northern Finland. Field observations agreed with this finding. Semenov-Tjan-Sanskij's (1959) study and the present work confirm that these leaves are of no importance in the nutrition of the Capercaillie in the northern Fenno-scandian taiga and subarctic, although they are available to a small extent. Seiskari & Koskimies (1955) stated that the amount of these leaves is not great enough to warrant an adaptation of the population to take advantage of these foods. It could be added that in northern Finland aspens grow individually or in small groups, and feeding in their crowns would presume flying at crown level in order to find them, while there is an abundance of nutritious food easily available on the ground.

The macroscopic (Semenov-Tjan-Sanskij 1959 and present results) and chemical (present results) compositions of the diet of the Capercaillie appear to change gradually from September to November/December, although during this period these birds move from feeding on the ground to feeding in the trees and at the same time change habitat from moist and/or fresh places to dry heaths and/or pine peat-bogs, as shown by Seiskari (1962) and very clearly by the plant species identified in the crop samples here. Gallinaceous birds apparently avoid sudden changes in the composition of their diet, as has been shown by Pulliainen (1965) in the Partridge *(Perdix perdix).* The micro-organisms of their caeca in particular need time to adapt to a new diet.

A previous examination of the composition of the winter food by the Capercaillie in the same area (Pulliainen 1970) established that these birds are apparently able to select the needles with the highest nitrogen content, the pine needles found in the crops containing an average of 11.24% nitrogen. The nitrogen content of the pine matter in the crops recorded here in December varied between 11.4 and 11.7%. Using the coefficient of 6.25 (c.f., however, Klein 1965), the corresponding crude protein content is 7.0–7.3%. The Capercaillie thus seems to survive in conditions of extreme cold on a diet containing about 2–3% less crude protein than Crossbills *(Loxia* spp.), Pine Grosbeaks *(Pinicola enucleator)* (see Pulliainen 1974) and Willow Grouse *(Lagopus lagopus)* (Steen 1978).

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References

Cibisov, S.D. 1978: Pitanie gluhar'a na Severo-vostoke Komi ASSR – Ekologi'a 1978 (3): 89–90.

Helminen, M. 1963: Composition of the Finnish populations of capercaillie, *Tetrao urogallus,* and black grouse, *Lyrurus tetrix,* in the autumns of 1952–1961, as revealed by a study of wings – Papers Game Res. 23: 1–124.

Klein, D.R. 1965: Ecology of deer range in Alaska – Ecol. Monographs 35: 259–284.

Koskimies, J. 1958: Seasonal, geographical and yearly trends in the weight of capercaillie *(Tetrao urogallus)* and blackgame *(Lyrurus tetrix)* in Finland – Ornis Fennica 35: 1–18.

Kuzmina, M.A. 1977: Teterevinye i Fazanovye SSSR – 294 pp. Alma-Ata.

Pulliainen, E. 1965: Studies on the weight, food and feeding behaviour of the partridge *(Perdix perdix* L.) in Finland – Ann. Acad. Sci. Fenn. A IV Biol. 93: 1–76.

Pulliainen, E. 1970: Composition and selection of winter food by the capercaillie *(Tetrao urogallus)* in northeastern Finnish Lapland – Suomen Riista 22: 67–73.

Pulliainen, E. 1973: Winter ecology of the red squirrel *(Sciurus vulgaris* L.) in northeastern Lapland – Ann. Zool. Fennici 10: 487–494.

Pulliainen, E. 1974: Winter nutrition of the common crossbill *(Loxia curvirostra)* and the pine grosbeak *(Pinicola enucleator)* in northeastern Lapland in 1973 – Ann. Zool. Fennici 11: 204–206.

Seiskari, P. 1962: On the winter ecology of the capercaillie, *(Tetrao urogallus),* and the black grouse, *(Lyrurus tetrix),* in Finland – Papers Game Res. 22: 1–119.

Seiskari, P. & Koskimies, J. 1955: Ecological evidence of racial divergence in the capercaillie, *(Tetrao urogallus L.),* in Finland – Papers Game Res. 16: 1–11.

Semenov-Tjan-Sanskij, O. 1959: Ekologija teterevinyh ptits. – Trudy Laplandskogo Gosudarstvennogo Zapovednika 5: 1–318.

Steen, J.B. 1978: Rypeboka – 231 pp. Oslo.

Zwickel, F.C. 1966: Winter food habits of Capercaillie in north-east Scotland – British Birds 59: 325–336.

Discussion

Dr. Jenkins. I would like to know what proportion of the food of young Capercaillie chicks is animal matter?

Dr. Cheng. I found that animal matter comprised 75% of the food of young Capercaillie.

Dr. Moss. Have any differences in nutrient requirements been found between juvenile male and females, especially in view of Per Wegge's paper?

Professor Pulliainen. One of my students has studied this topic; it was found that the nitrogen content of the food of juvenile males is higher than that of juvenile females.

Professor Curry-Lindahl. I am surprised to hear that young Capercaillie can survive on a mainly vegetable diet, and I would like to ask for greater detail.

Dr. Moss. Red Grouse chicks are opportunists and will take many insects if available, and I believe that other grouse chicks act in similar manner. Their protein requirements are high, but the newly growing heather shoots, which are the main part of their diet, are of high nutrient value and they can survive and grow well on a diet containing as little as 5% of insects by dry weight. (Ref. Savory C J (1977) Ibis 119, 1–9).

Mr. Wegge. May I recall Dr. Rajala's work on captive young Capercaillie, which ate mainly animal food up to three weeks of age and then changed to vegetable matter.

Dr. Rajala. That is so; this change-over occurs at about 25 days old in Capercaillie, 18 days in Black Grouse and Hazelhen, and at 10 to 11 days in Willow Grouse. My question is whether spruce needles have been found in the crops of Capercaillie?

Professor Pulliainen. Spruce needles are found frequently, but by dry weight the percentage is very low.

Keith Howman. There is a much larger volume of food eaten by strictly vegetarian birds such as Capercaillie compared with omnivorous species such as the Game Pheasant; 5% of a large intake is therefore a considerable quantity.

Dr. Moss. This is certainly so in adults; there seems to be little evidence on this point in chicks.

Arthur Cadman. Is larch *Larix decidua* present in the study area? I have observed both Capercaillie and Black Grouse eating the young shoots of this tree avidly.

Professor Pulliainen. *Larix sibirica* exists in one small area of this study, but otherwise larch is absent.

Dr. Jenkins. Professor Pulliainen, could you make a summary of this discussion?

Professor Pulliainen. We have mainly talked about the nutrition of very young chicks, while my paper concerned the nutrition of young and adult Capercaillie in autumn and winter. We do know that both the chicks and the young need highly nutritious food. The proportions of N and P are then important. The percentage of crude protein gives, however, a rough picture of the protein content of the food. Small proportions and quantities of animal matter may be important, when they contain essential amino acids which are readily available in them.

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